National Institute of Environmental Health Sciences

Spatiotemporal model or time series model for assessing city-wide temperature effects on mortality?

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Abstract:

Most studies examining the temperature-mortality association in a city used temperatures from one site or the average from a network of sites. This may cause measurement error as temperature varies across a city due to effects such as urban heat islands. We examined whether spatiotemporal models using spatially resolved temperatures produced different associations between temperature and mortality compared with time series models that used non-spatial temperatures. We obtained daily mortality data in 163 areas across Brisbane city, Australia from 2000 to 2004. We used ordinary kriging to interpolate spatial temperature variation across the city based on 19 monitoring sites. We used a spatiotemporal model to examine the impact of spatially resolved temperatures on mortality. Also, we used a time series model to examine non-spatial temperatures using a single site and the average temperature from three sites. We used squared Pearson scaled residuals to compare model fit. We found that kriged temperatures were consistent with observed temperatures. Spatiotemporal models using kriged temperature data yielded slightly better model fit than time series models using a single site or the average of three sites' data. Despite this better fit, spatiotemporal and time series models produced similar associations between temperature and mortality. In conclusion, time series models using non-spatial temperatures were equally good at estimating the city-wide association between temperature and mortality as spatiotemporal models.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Air Pollution, Meteorological Factors, Temperature

Air Pollution: Ozone, Particulate Matter

Temperature: Extreme Heat

Geographic Feature:

resource focuses on specific type of geography

Ocean/Coastal, Urban

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Australasia

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Morbidity/Mortality

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Methodology

Resource Type: ☑

format or standard characteristic of resource

Research Article, Research Article

Timescale: ☑

time period studied

Time Scale Unspecified